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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte AMITAVA SENGUPTA,
LINUS I. HOLSTEIN, and
E. WAYNE BOULDIN

Appeal 2009-002199
Application 10/812,450
Technology Center 1700

Decided: August 28, 2009

Before EDWARD C. KIMLIN, ADRIENE LEPIANE HANLON, and TERRY J. OWENS, *Administrative Patent Judges*.

HANLON, *Administrative Patent Judge*.

DECISION ON APPEAL

A. STATEMENT OF THE CASE

This is an appeal under 35 U.S.C. § 134 from an Examiner's decision rejecting claims 1, 3-8, and 10-22. We have jurisdiction under 35 U.S.C. § 6(b). We REVERSE.

The subject matter on appeal is directed to a membrane contactor. Claims 1, 7, 8, 14, and 19-22 are the independent claims on appeal. Claim 1, reproduced below, is illustrative.

1. A hollow fiber membrane contactor comprising:

a cartridge;

said cartridge comprising:

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each of said center tube ends;

a plug located at said first tube sheet; and

said fiber lumens being open at said first tube sheet and said fiber lumens being closed at said second tube sheet;

a shell having two ends and an opening, said shell being adapted to enclose said cartridge;

said tube sheets being sealed to said shell;

a first end cap having an opening therethrough;

said first end cap being adjoined to said first end of said shell where said first end cap and said first tube sheet defining a first head space therebetween;

said first end cap opening being in communication with said hollow fiber lumens via said first head space;

> a second end cap having an opening therethrough;
>
> *said second end cap being adjoined to said second end of said shell where said second end cap and said second tube sheet defining a second head space therebetween*;
>
> *said second end cap opening being in communication with said center tube via said second head space*;
>
> wherein fluid being introduced into said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening, and a vacuum being applied via said first end cap opening;
>
> wherein said shell, said first end cap, said second end cap, said center tube, said first tube sheet, said second tube sheet, and said plug are made from a same material.

App. Br. 40-41, Claims Appendix (emphasis added).[1]

Claims 7, 14, 19, 20, and 22 are also directed to a membrane contactor comprising a second end cap opening in communication with a center tube via a second head space as defined in claim 1. App. Br. 42-44, 46-48, 49-52, and 53-55, Claims Appendix.

Similarly, claims 8 and 21 are directed to a membrane contactor:

> wherein said other end cap and said other tube sheet defining a second head space therebetween where said end cap opening being in communication with said center tube via said second headspace . . . .

App. Br. 45, 53, Claims Appendix.

The following Examiner's rejections are before us on appeal:

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[1] Appeal Brief dated April 25, 2008.

(1) Claims 1, 3-8, and 10-22 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Cho[2] and Kuzumoto.[3]

(2) Claims 1, 3-8, and 10-22 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Anderson[4] and Cho.

B. ISSUE

Have the Appellants identified reversible error in the Examiner's finding that the prior art of record teaches a membrane contactor comprising a second end cap opening in communication with a center tube via a second head space as recited in the claims on appeal?

C. PRINCIPLES OF LAW

During examination, "the PTO must give claims their broadest reasonable construction consistent with the specification." *In re Icon Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007); *see also In re Prater*, 415 F.2d 1393, 1404-05 (CCPA 1969) (unpatented claims "are to be given the broadest reasonable interpretation consistent with the specification").

D. FINDINGS OF FACT

1. Cho

The Examiner directs our attention to Cho Figure 4. Ans. 4.[5] Cho Figure 4, reproduced below, illustrates a membrane contactor. Cho 2:44-45.

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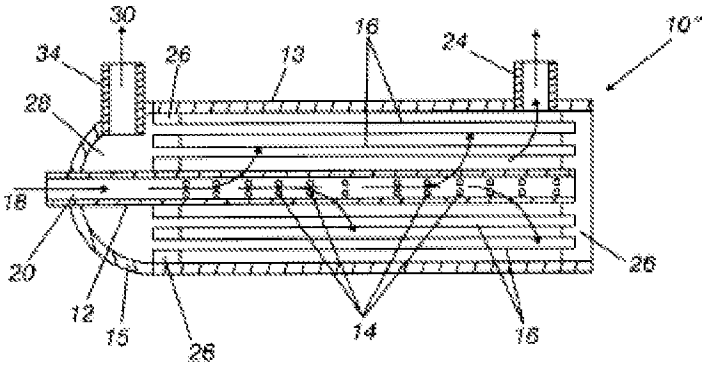
[2] US 6,616,841 B2 to Cho issued September 9, 2003.
[3] US 4,623,460 to Kuzumoto issued November 18, 1986.
[4] US 2003/0154856 A1 to Anderson published August 21, 2003.
[5] Examiner's Answer dated May 12, 2008.



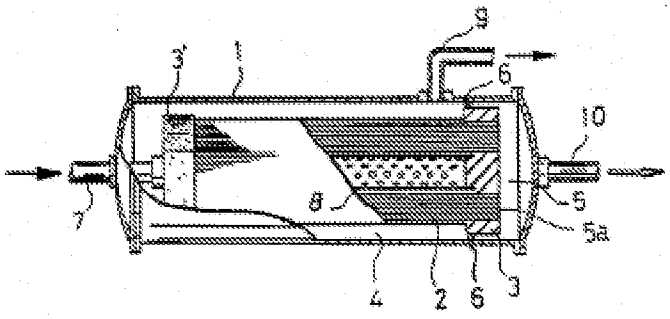
Cho Figure 4 depicts a hollow fiber membrane contactor.

In operation, liquid 18 enters the liquid inlet 20 of the core tube 12, exits the tube 12 via perforations 14, travels over the exterior surfaces of the hollow fibers 16, and exits the shell side via an outlet 24. Cho 4:52-55.

The hollow fibers 16 are in communication with headspace 28 so that a vacuum 30 drawn at port 34 is in communication with the lumen side of hollow fibers 16 via headspace 28. Cho 3:1-5, 4:48-50.

2. Kuzumoto

Kuzumoto Figure 1, reproduced below, illustrates a fluid separation element. Kuzumoto 1:30-33.



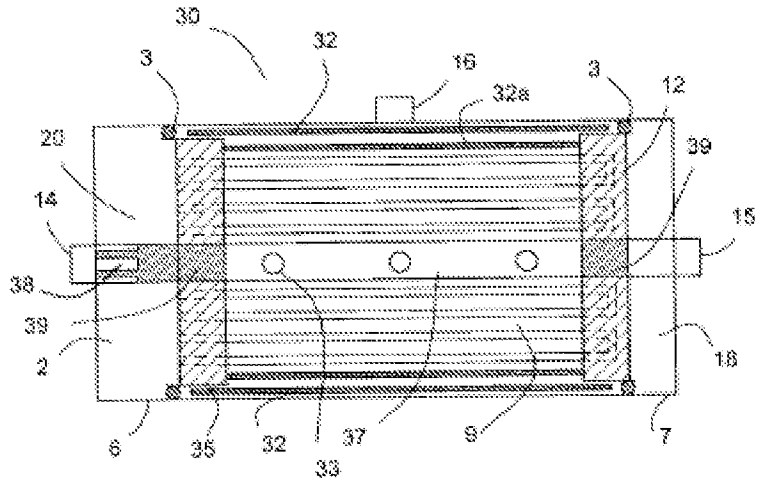
Kuzumoto Figure 1 depicts a fluid separation element.

The Examiner found that the fluid separation element comprises a first end cap (at 5), a first tube sheet 3, a second end cap (at 7), a second tube sheet 3', and a perforated tube 8. Ans. 8. The Examiner found that the perforated tube 8 is connected to connector tube 7. Ans. 11, 17-18.

In operation, the fluid to be treated comes from an inlet pipe 7 into the separation element and flows through the pipe 8. The fluid exits the holes at the wall of the pipe 8, flows through the inner compartment 4, and is discharged from an outlet pipe 9. Kuzumoto 1:49-53.

3. Anderson

The Examiner directs our attention to Anderson Figure 3. Ans. 12. Anderson Figure 3, reproduced below, illustrates a hollow fiber membrane cartridge.



Anderson Figure 3 depicts a gas separation device.

The Examiner found that perforated center tube 37 is connected to port 15. Ans. 12, 17-18; Anderson, para. [0025].

E. ANALYSIS

The claims on appeal recite that a second head space is defined between the second end cap and the second tube sheet. The second end cap opening is in communication with the center tube via this second head space. *See* claims 1, 7, 8, 14, and 19-22.

The Appellants argue that Cho, Kuzumoto, and Anderson, either alone or in combination, do not teach or suggest a second end cap opening in communication with a center tube via the claimed second head space. App. Br. 19-20, 33-34. Instead, the Appellants argue that these references teach end cap openings that are in direct communication with the center tube. App. Br. 20, 34, 36.

The Appellants' argument is well supported by the record. It is reasonable to find that each of the references discloses a membrane contactor comprising at least one head space disposed between an end cap and a tube sheet. However, none of the references discloses an end cap opening in communication with a center tube via the head space. In particular, Cho discloses that the end cap opening communicates directly with the center tube 12 via inlet 20, Kuzumoto teaches that the end cap opening (at 7) communicates directly with the center pipe 8 via inlet pipe 7, and Anderson teaches that the end cap opening (at 7) communicates directly with the central tube 37 via exit port 15. Cho 4:52-53, Fig. 4; Kuzumoto 1:49-50, Fig. 1; Anderson, para. [0025], Fig. 3; App. Br. 20, 25, 35. The Examiner recognizes as much. *See* Ans. 17-18, 19.

Nonetheless, the Examiner contends that the end cap opening in Kuzumoto and Anderson is in communication with the center tube via the

head space by virtue of the fact that the center tube extends through the head space. Ans. 11, 14.

The Examiner's position is not based on a reasonable interpretation of the claim language at issue. The claims require the end cap opening to be "in communication," i.e., fluid communication, with the center tube "via the head space." In Kuzumoto and Anderson (as well as Cho), the end cap opening is not in communication with the center tube via the head space. Rather, the end cap opening in each of these references communicates with the center tube via an inlet tube or port.

In the alternative, the Examiner contends that an area inside the inlet pipe 7 of Kuzumoto or an area inside the center tube 37 of Anderson can be considered the second head space "because it is a space, and it is between the tube sheet and the end cap opening." Ans. 23; *see also* Ans. 11, 21, 22.

The Examiner's position is not reasonable based on the record before us. The claims on appeal recite that a second head space is defined between the second end cap and the second tube sheet. Claims 1, 7, 8, 14, and 19-22; *see also* Appellants' Fig. 1; Spec. 5:6-9 (reference numeral 32 refers to the second head space). The space inside the inlet pipe 7 and the center tube 37 of the prior art is not defined by an end cap and a tube sheet as recited in the claims on appeal, but rather, is defined by the pipe or tube itself.

For the reasons set forth above, we cannot sustain the §103(a) rejections on appeal.

F. DECISION

The decision of the Examiner is reversed.

REVERSED

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